

APPENDIX A

REFERENCE CRITERIA AND REFERENCE SITES

Appendix A. Index Composition Alternatives

Appendix A-1. Land-Use/Land-Cover criteria. (Data from 1-km buffer using MRLC 1992 land cover data.)

Land Use	Source	Bioregion	Value	Notes
AGR	BPJ	Mountains	>15	screening, 1km buffer, MRLC 1992
AGR	BPJ	Plains	>30	screening, 1km buffer, MRLC 1992
AGR	BPJ	Xeric	>30	screening, 1km buffer, MRLC 1992
FOR	BPJ	Mountains	<60	screening, 1km buffer, MRLC 1992
FOR	BPJ	Xeric	<15	screening, 1km buffer, MRLC 1992
URB	BPJ	Mountains	>10	screening, 1km buffer, MRLC 1992
URB	BPJ	Plains	>20	screening, 1km buffer, MRLC 1992
URB	BPJ	Xeric	>20	screening, 1km buffer, MRLC 1992

There was no criterion for forested land cover in the Plains.

Appendix A-2. Habitat criteria

Parameter	HabFormVersion	Source	Bioregion	Value	Notes
Channel Alteration	1990-07-01	BPJ	Mountains	<=7	Marginal or Poor (avg score)
Channel Alteration	1992-05-27	BPJ	Mountains	<=7	Marginal or Poor (avg score)
Channel Alteration	1992-07-24	BPJ	Mountains	<=7	Marginal or Poor (avg score)
Channel Alteration	1993-02-11	BPJ	Mountains	<=2	Marginal or Poor (avg score)
Substrate composition	1993-02-11	EMAP	Mountains	<=1	> 15% Fines
Embeddedness	05-27-1992	EMAP	Mountains	<=15	> 15% Fines
Embeddedness	1990-07-01	EMAP	Mountains	<=15	> 15% Fines
Percent Fines		EMAP	Mountains	15	Fines, < 2mm, (% Silt/Clay + % Sand)
Channel Alteration	1990-07-01	BPJ	Plains	<=7	Marginal or Poor (avg score)
Channel Alteration	1992-05-27	BPJ	Plains	<=7	Marginal or Poor (avg score)
Channel Alteration	1992-07-24	BPJ	Plains	<=7	Marginal or Poor (avg score)
Channel Alteration	1993-02-11	BPJ	Plains	<=2	Marginal or Poor (avg score)
Percent Fines		EMAP	Plains	90	Fines, < 2mm, (% Silt/Clay + % Sand)
Channel Alteration	1990-07-01	BPJ	Xeric	<=7	Marginal or Poor (avg score)
Channel Alteration	1992-05-27	BPJ	Xeric	<=7	Marginal or Poor (avg score)
Channel Alteration	1992-07-24	BPJ	Xeric	<=7	Marginal or Poor (avg score)
Channel Alteration	1993-02-11	BPJ	Xeric	<=2	Marginal or Poor (avg score)
Percent Fines		EMAP	Xeric	90	Fines, < 2mm, (% Silt/Clay + % Sand)
Total Score	Jul-90	BPJ	all	<=88	Marginal or Poor (avg score)
Total Score	1992-05-27	BPJ	all	<=66	Marginal or Poor (avg score)
Total Score	1992-07-24	BPJ	all	<=66	Marginal or Poor (avg score)
Total Score	1993-02-11	BPJ	all	<=14	Marginal or Poor (avg score)

Marginal or poor habitat = human influenced channelization (construction or flow). Not natural.

Percent Fines derived from pebble count data.

Appendix A. Index Composition Alternatives

Appendix A-3. Water Chemistry

Parameter	Units	Bioregion	Source	Value	Notes
Arsenic, dissolved	µg/L	Mountains	CO WQ stds	>340	aquatic life, acute
Arsenic, dissolved	µg/L	Plains	CO WQ stds	>340	aquatic life, acute
Arsenic, dissolved	µg/L	Xeric	CO WQ stds	>340	aquatic life, acute
Chloride	mg/L	Mountains	EMAP	>3.55	
Chloride	mg/L	Plains	EMAP	>35.45	
Chloride	mg/L	Xeric	EMAP	>35.45	
Conductivity	µS/cm	Mountains	MT	>4000	
Conductivity	µS/cm	Plains	MT	>4000	
Conductivity	µS/cm	Xeric	MT	>4000	
Dissolved Oxygen	mg/L	Mountains	CO WQ stds	<6	aquatic life, coldwater
Dissolved Oxygen	mg/L	Plains	CO WQ stds	<5	aquatic life, warmwater
Dissolved Oxygen	mg/L	Xeric	CO WQ stds	<6	aquatic life, coldwater
E Coli	#/100 ml	Mountains	CO WQ stds	>630	recreational, secondary contact
E Coli	#/100 ml	Plains	CO WQ stds	>630	recreational, secondary contact
E Coli	#/100 ml	Xeric	CO WQ stds	>630	recreational, secondary contact
Fecal Coliform	#/100 ml	Mountains	CO WQ stds	>2000	recreational, secondary contact
Fecal Coliform	#/100 ml	Plains	CO WQ stds	>2000	recreational, secondary contact
Fecal Coliform	#/100 ml	Xeric	CO WQ stds	>2000	recreational, secondary contact
Iron, total	µg/L	Mountains	CO WQ stds	>1000	aquatic life, chronic
Iron, total	µg/L	Plains	CO WQ stds	>1000	aquatic life, chronic
Iron, total	µg/L	Xeric	CO WQ stds	>1000	aquatic life, chronic
Mercury, dissolved	µg/L	Mountains	CO WQ stds	>1.4	aquatic life, acute
Mercury, dissolved	µg/L	Plains	CO WQ stds	>1.4	aquatic life, acute
Mercury, dissolved	µg/L	Xeric	CO WQ stds	>1.4	aquatic life, acute
Nitrate	mg/L	Mountains	EMAP	>6.2	
Nitrogen, total	µg/L	Mountains	EMAP	>750	
Nitrogen, total	µg/L	Plains	EMAP	>4500	
Nitrogen, total	µg/L	Xeric	EMAP	>1500	
pH	SU	Mountains	EMAP	>9	also in WQ stds - aquatic life
pH	SU	Mountains	CO WQ stds	<6.5	
pH	SU	Plains	EMAP	>9	also in WQ stds - aquatic life
pH	SU	Plains	CO WQ stds	<6.5	
pH	SU	Xeric	EMAP	>9	also in WQ stds - aquatic life
pH	SU	Xeric	CO WQ stds	<6.5	

Appendix A. Index Composition Alternatives

Appendix A-3. Water Chemistry continued

Parameter	Units	Bioregion	Source	Value	Notes
Phosphorus as P	mg/L	Mountains	EMAP	>0.02	
Phosphorus as P	mg/L	Plains	EMAP	>0.15	
Phosphorus as P	mg/L	Xeric	EMAP	>0.05	
Phosphorus, total	µg/L	Mountains	EMAP	>20	
Phosphorus, total	µg/L	Plains	EMAP	>150	
Phosphorus, total	µg/L	Xeric	EMAP	>50	
Selenium, dissolved	µg/L	Mountains	CO WQ stds	>18.4	aquatic life, acute
Selenium, dissolved	µg/L	Plains	CO WQ stds	>18.4	aquatic life, acute
Selenium, dissolved	µg/L	Xeric	CO WQ stds	>18.4	aquatic life, acute
Sulfate	mg/L	Mountains	EMAP	>9.6	(WY 15)
Sulfate	mg/L	Plains	WY	>100	
Sulfate	mg/L	Xeric	WY	>30	
Temperature, Water	°C	Mountains	CO WQ stds	>20	aquatic life, coldwater
Temperature, Water	°C	Plains	CO WQ stds	>30	aquatic life, warmwater
Temperature, Water	°C	Xeric	CO WQ stds	>20	aquatic life, coldwater
Turbidity	NTU	Plains	EMAP	>50	

Appendix A. Index Composition Alternatives

Appendix A-4. Reference Sites

StationID	Waterbody Name	Sampling Date	Bioregion	Status	Program
EPA01-238	PURGATOIRE RIVER	7/6/2001	Plains	Ref	Ben_STAR
EPA02-CC01	CHERRY CREEK	6/26/2002	Plains	Ref	Ben_STAR
EPA02-RR01	NORTH FORK REPUBLICAN RIVER	6/26/2002	Plains	Ref	Ben_STAR
EPA02-SPR01	South Platte R.	6/28/2002	Plains	Ref	Ben_STAR
WCOP01-0812		9/17/2002	Plains	Ref	Ben_EMAP
WCOP01-0819		9/18/2002	Plains	Ref	Ben_EMAP
10160	Texas Creek	8/13/1996	Mountains	Ref	Ben_CODPHE
12165-A	St. Louis Creek	9/10/1997	Mountains	Ref	Ben_CODPHE
12182	Roaring Fork River	9/9/1997	Mountains	Ref	Ben_CODPHE
4.02114E+14	BIG THOMPSON BL MORaine PARK	9/13/1995	Mountains	Ref	Ben_NAWQA
9010500	COLORADO R BELOW BAKER GULCH	8/6/1996	Mountains	Ref	Ben_NAWQA
CO001M	Middle Fork South Platte	8/22/1994	Mountains	Ref	Ben_REMAP
CO006M	Elk Creek	9/20/1994	Mountains	Ref	Ben_REMAP
CO007M	Goose Creek	9/16/1994	Mountains	Ref	Ben_REMAP
CO015M	Cottonwood Creek	9/7/1994	Mountains	Ref	Ben_REMAP
CO01RS	Middle St. Vrain Creek	9/5/1994	Mountains	Ref	Ben_REMAP
CO02RS	Cross Creek	9/13/1994	Mountains	Ref	Ben_REMAP
CO033M	Pass Creek	8/1/1994	Mountains	Ref	Ben_REMAP
CO038M	Middle Fork North Crestone	8/11/1994	Mountains	Ref	Ben_REMAP
CO03RS	Hope Creek	8/1/1994	Mountains	Ref	Ben_REMAP
CO03RS	Hope Creek	9/21/1995	Mountains	Ref	Ben_REMAP
CO044M	East Lake Creek	9/2/1994	Mountains	Ref	Ben_REMAP
CO045M	Frying Pan River	9/15/1994	Mountains	Ref	Ben_REMAP
CO046M	Coal Creek	8/23/1994	Mountains	Ref	Ben_REMAP
CO051M	Lottis Creek	8/17/1994	Mountains	Ref	Ben_REMAP
CO05RS	Halfmoon Creek	9/13/1994	Mountains	Ref	Ben_REMAP
CO062M	Middle Anthracite Creek	9/26/1994	Mountains	Ref	Ben_REMAP
CO063M	East Fork Dallas Creek	8/8/1994	Mountains	Ref	Ben_REMAP
CO066M	Los Pinos Creek	8/30/1994	Mountains	Ref	Ben_REMAP
CO067M	Silver Creek	8/1/1994	Mountains	Ref	Ben_REMAP
CO069M	Cunningham Creek	8/9/1994	Mountains	Ref	Ben_REMAP
CO06RS	S. Fork Mineral Creek	8/19/1995	Mountains	Ref	Ben_REMAP
CO070M	Lime Creek	8/4/1994	Mountains	Ref	Ben_REMAP
CO102M	Middle Fork Boulder Creek	9/13/1995	Mountains	Ref	Ben_REMAP

Appendix A. Index Composition Alternatives

Appendix A-4. Continued

StationID	Waterbody Name	Sampling Date	Bioregion	Status	Program
CO112M	North Fork Frying Pan	9/6/1995	Mountains	Ref	Ben_REMAP
CO113M	North Fork St. Vrain	9/14/1995	Mountains	Ref	Ben_REMAP
CO116M	Garner Creek	8/28/1995	Mountains	Ref	Ben_REMAP
CO122M	S. Fork Saguache Creek	8/23/1995	Mountains	Ref	Ben_REMAP
CO128M	Junction Creek	8/17/1995	Mountains	Ref	Ben_REMAP
CO129M	E. Fork Hermosa Creek	8/14/1995	Mountains	Ref	Ben_REMAP
CO133M	Trout Creek	8/17/1995	Mountains	Ref	Ben_REMAP
CO142M	North Anthrocite Creek	9/13/1995	Mountains	Ref	Ben_REMAP
CO154M	Middle Fork Cottonwood Creek	8/18/1995	Mountains	Ref	Ben_REMAP
CO157M	North Fork Lake Creek	9/5/1995	Mountains	Ref	Ben_REMAP
CO158M	Taylor River	9/7/1995	Mountains	Ref	Ben_REMAP
CO159M	Italian Creek	9/7/1995	Mountains	Ref	Ben_REMAP
CO174M	Scott Gomer Creek	9/11/1995	Mountains	Ref	Ben_REMAP
EPA01-166	BUZZARD CREEK	8/9/2001	Mountains	Ref	Ben_STAR
EPA01-167	BUCK CREEK	8/11/2001	Mountains	Ref	Ben_STAR
EPA01-168	FAWN CREEK	8/11/2001	Mountains	Ref	Ben_STAR
EPA01-169	DEEP CREEK	8/12/2001	Mountains	Ref	Ben_STAR
EPA01-171	MIDDLE FORK LITTLE SNAKE RIVER	8/13/2001	Mountains	Ref	Ben_STAR
EPA01-172	CACHE LA POUDE RIVER	8/14/2001	Mountains	Ref	Ben_STAR
EPA01-239	SOUTH APACHE CREEK	7/7/2001	Mountains	Ref	Ben_STAR
EPA01-240	WAHATOYA CREEK	7/9/2001	Mountains	Ref	Ben_STAR
EPA01-241	HUERFANO RIVER	7/10/2001	Mountains	Ref	Ben_STAR
EPA01-242	El Rito Azul	7/11/2001	Mountains	Ref	Ben_STAR
EPA01-243	EAST FORK DALLAS CREEK	7/13/2001	Mountains	Ref	Ben_STAR
EPA01-245	CEBOLLA CREEK	7/14/2001	Mountains	Ref	Ben_STAR
EPA01-246	BIG BLUE CREEK	7/16/2001	Mountains	Ref	Ben_STAR
EPA01-247	AGATE CREEK	7/17/2001	Mountains	Ref	Ben_STAR
EPA01-248	COTTONWOOD CREEK	7/18/2001	Mountains	Ref	Ben_STAR
EPA01-249	NEWLIN CREEK	7/19/2001	Mountains	Ref	Ben_STAR
EPA01-250	GOOSE CREEK	7/22/2001	Mountains	Ref	Ben_STAR
EPA01-251	WIGWAM CREEK	7/25/2001	Mountains	Ref	Ben_STAR
EPA01-252	ROCK CREEK	7/26/2001	Mountains	Ref	Ben_STAR
EPA01-253	NORTH COTTONWOOD CREEK	7/27/2001	Mountains	Ref	Ben_STAR
EPA01-254	RESOLUTION CREEK	7/31/2001	Mountains	Ref	Ben_STAR

Appendix A. Index Composition Alternatives

Appendix A-4. Continued

StationID	Waterbody Name	Sampling Date	Bioregion	Status	Program
EPA01-256	Willis Gulch	8/1/2001	Mountains	Ref	Ben_STAR
EPA01-257	TAYLOR RIVER	8/4/2001	Mountains	Ref	Ben_STAR
EPA01-258	COAL CREEK	8/5/2001	Mountains	Ref	Ben_STAR
EPA01-259	DEEDS CREEK	8/8/2001	Mountains	Ref	Ben_STAR
EPA01-260	ROCK CREEK	8/9/2001	Mountains	Ref	Ben_STAR
EPA01-261	LAKE FORK	8/10/2001	Mountains	Ref	Ben_STAR
EPA01-262	JEFFERSON FORK	8/11/2001	Mountains	Ref	Ben_STAR
WCOP99-0503	LOST MAN CREEK	7/27/2000	Mountains	Ref	Ben_EMAP
WCOP99-0505	CLEAR FORK	8/17/2000	Mountains	Ref	Ben_EMAP
WCOP99-0518	OUZEL CREEK	7/10/2000	Mountains	Ref	Ben_EMAP
WCOP99-0577	N.ST VRain CREEK	7/16/2001	Mountains	Ref	Ben_EMAP
WCOP99-0597	DYER CR. (RF3=CRYSTAL CREEK)	5/21/2002	Mountains	Ref	Ben_EMAP
WCOP99-0626	FALL RIVER	9/5/2002	Mountains	Ref	Ben_EMAP
WCOP99-0634	UTE CREEK	8/13/2002	Mountains	Ref	Ben_EMAP
WCOP99-0649	NONAME CREEK	7/23/2002	Mountains	Ref	Ben_EMAP
CO04RS	Little Cimarron Creek	8/16/1994	Xeric	Ref	Ben_REMAP
CO04TS	East Willow Creek	8/11/1994	Xeric	Ref	Ben_REMAP
CO072M	Junction Creek	8/1/1994	Xeric	Ref	Ben_REMAP
WCOP99-0595	E. RIFLE CREEK	8/2/2001	Xeric	Ref	Ben_EMAP